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QUARTERLY REPORT Project WP#339: Structural Significance of Mechanical Damage

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Project WP#339: Structural Significance of Mechanical Damage

1 Background

The primary objective of the project is to establish a detailed experimental database to support the development and validation of improved burst and fatigue strength models for assessing the interaction of mechanical damage with secondary features (gouges, corrosion, and welds). The data will be used to develop and validate mechanistic models which will produce reliable tools to assess a wide range of mechanical damage forms. This will improve safety, reduce unnecessary maintenance, and support the improvement of pipeline standards and codes of practice.

2 Progress in the Quarter

A summary of the technical results are:

- Task 2—Material characterization are complete for Pipe 1 and Pipe 2;
- Task 3—The literature review of cyclic fatigue dent assessment techniques is complete;
- Task 4—The testing of dents and dents interacting with girth welds and corrosion metal loss is complete for modern steels. Full-scale testing of dents using vintage steel materials is underway and will continue;
- Task 5—The fatigue test on dent+gouge defect 1.3.3 is ongoing and its lifetime has exceeded 18,000 cycles. Additional investigation of the hardened layer showed that this layer could be created from tooth material deposited during aggression.

2.1 Technical Issues, Problems or Challenges

As discussed above, the team began preliminary material characterization of the vintage pipe for Pipe 3 in September 2010 and went on with other vintage pipes (i.e., Pipe 4 and other pipe materials to be used for dent+gouge test samples). However, the full characterization will continue through at least March 2011. The team believes that this delay will not affect the overall project schedule, since other testing will continue in parallel during this time. The team is in the process of evaluation options to expedite the characterization process.

2.2 Plans for Future Activity

Planned activities for the project are presented below.

2.2.1 Task 2: Purchase & Characterize Pipe Material

The team is characterizing three vintage pipes (Pipe 4a, b, and c) which are potential candidates for the DOT program. GDF SUEZ is providing one pipe and they have to confirm Charpy values. The team expects the results before the end of March 2011. Then, they will choose between the three vintage pipes and will start the dent + gouge tests on the chosen vintage pipe.

2.2.2 Task 4: Testing of Dents on Welds and Corrosion Features

The full scale test matrix for the next set of Pipe 3 dent fatigue tests will be finalized and circulated to the project team and PRCI member companies for approval and subsequent testing.

2.2.3 Task 5: Testing of Dents with Gouges

GDF SUEZ will continue the destructive characterization of defect 1.1.1b and will send defects 1.2.1b, 2.1.1 and 2.2.1 to Chalk River in Canada for neutron diffraction analysis of residual stresses.